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Functional Plant Biology

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This Viewpoint article addresses a very significant political issue in international agriculture. With parts of Southern Africa are experiencing the third major drought in five years, the author offers his analysis of political and scientific factors affecting adoption of genetically modified (GM) crops in Africa. Drought-induced food shortages have necessitated the provision of genetically modified crops as food aid to the region by developed nations. The author examines the background and reasons behind the condemnation of GM crops by southern African nations, and considers whether the lack of support of agricultural biotechnology by European nations has contributed to this situation. Furthermore, the necessity of agricultural biotechnology in future African development is considered.

This work investigates an important field: the importance of hydraulic conductance of protoplasts of leaf parenchyma in determining the conductance of leaf lamina. It presents novel and interesting data for ontogenetic changes in shoot hydraulic conductance for six temperate species, and in that of $HgCl_2$-treated shoots. The authors determine the portioning of leaf blade conductance between symplasmic (protoplasmic) and apoplasmic conductance, and analyse their effect on whole-lamina hydraulic conductance. Substantial differences were found between fast- and slow-growing species. The main conclusions are that the cell-to-cell and apoplast pathways account equally for temporal variation within a species, while the apoplast pathway more likely accounts for the differences between species. This demonstrates that the cell-to-cell pathway can be significant at normal flow rates through the leaf.

Water-use efficiency is an important and challenging trait to evaluate, and this paper provides important new perspectives on its regulation in two major crop systems. This work evaluates the genetic dependence and environmental stability of carbon isotope discrimination (CID) in rice and tomato. The authors evaluate plants grown under a wide range of environmental conditions including variation in temperature, light, nutrient availability, and variable soil volumes. They evaluate genetic and environmental contributions to variation in growth rates, plant morphology, plant nutrient contents, and gas-exchange rates, and compare them to variation shown in CID. They conclude that intercellular CO_2 levels, as indicated by CID, are closely regulated in each genotype in a semi-homeostatic manner.

Cover illustration: Africa urgently needs to adopt modern agricultural technologies to meet the food production requirements of a constantly expanding population. (See Bodulovic pp. 1069–1075.)